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BULLETIN
OF THE
TORREY BOTANICAL CLUB

MARCH 1902

American Ferns—III. Our Genera of Aspidieae

BY LUCIEN MARCUS UNDERWOOD

The natural arrangement of fern groups has too often suffered materially by the systematist insisting exclusively on this or that set of characters as primary in importance, to the neglect of others, whereas the sum of characters combined with habit would seem to result in a more natural system. John Smith, whose knowledge of ferns in cultivation probably exceeded that of any other man, emphasized as primary the character of the rootstock, separating those genera in which the stipes are articulated to the rootstock from those in which the stipes are continuous. On this basis *Phegopteris* and *Polypodium*, which at Kew are still kept in one genus, were distributed at opposite ends of the family. Presl and Fée emphasized venation, while Hooker disregarded both these series of characters except for sectional (or subgeneric) distinctions and made the presence or absence of an indusium and its form primary characters in the separation of genera. Mettenius and his followers in the later German school have quite largely disregarded most of these characters, and the recent treatment in Engler and Prantl, while more rational in several other tribes, passes all bounds in the Aspidieae in uniting under a single genus forms even more diverse than those that exist in some of the Hookerian aggregates.

It is clear that in the Aspidieae several series of characters must be taken into account, and the following would seem to be the arrangement in which they appear in the order of their relative weight:

1. Type of venation.

[Issued 24 March]

2. Habit and growth characters of stem.
3. Position of sori in relation to veins.
4. Indusial characters.

The venation of the fern, forming as it does a part of the primary anatomical structure of the plant, must furnish characters which are subject to less variation than those which pertain either to the location of the sori on the veins or to the character of the indusial covering of the sorus, which at best is only a member of the epidermal system, normally a flattened trichome, and, like terminal or peripheral members generally, is subject to variation to a greater extent from external causes. While accidental conditions of united veins occur in certain free-veined species, and in certain genera there exist species closely related by habit and structure, in some of which the veins are normally free and in others the veins anastomose, still the characters of free or anastomosing veins follow, in general, very clearly defined types and can fairly be taken to represent one of the most fundamental elements in the determination of generic groups.

The determination of generic characters having been accomplished, the question of generic names is an entirely different problem. This is a direct corollary of the proposition that a genus is a group of related species. The botanists of the middle period of the last century proceeded without rule; priority was not considered, and in taking up names one followed one fancy, and another a wholly different one, which resulted in the same name being applied to widely different aggregates. Since the attempt has now been made to adjust nomenclature by rule rather than by individual fancy it has become necessary to fix upon certain species as generic types* with which the generic name will inseparably stand as valid

*The student of generic types should not be misled by the use of the term type in a wholly different sense. In *Historia Filicum*, for example, John Smith uses the term "type" in the sense of the most common or well-known species included in his conception of the genus, whether it formed a part of the genus as originally proposed or not. Thus his type of *Nephrodium* is *Aspidium molle* Swz., which was not a part of the genus as originally founded by Richard, and is generically distinct from any species it did contain. The "biological type" or center of variation and divergence is also a wholly different matter and one that can never be fully determined until after the last species of any generic group has been described. The nomenclatorial type is the one considered here and, so far, it has only been definitely settled that this type must be a species mentioned in connection with the original publication of the genus.

or pass into synonymy according as views of generic limitations become closer or more elastic. The consideration of the present tangle is respectfully commended to those who are following the *ignis fatuus* of determining generic types by the subsequent history of the genus—a principle only slightly removed from the “method of residues” which in its original form now seems to be wholly abandoned by even its former strenuous advocates. For early genera only the historic type on which a genus was originally founded can stand before the acceptance of the first named species under the genus as its nomenclatorial type. This applies to all genera but principally concerns genera founded while botany was in a formative period when generic limits were not clearly drawn. Where a type species was named, that of course must take precedence over everything. Monotypic genera cannot come into question as their sole species must be the type on which they were founded.

Attention is called to the Aspidieae at this time, since we have recently had presented to us a rearrangement* of our native species under generic names, two of which are utterly untenable on any system of nomenclature yet followed, except that of personal preference. And, what is still more remarkable, this proposition comes from one who in the past has most loudly proclaimed against change of any sort and yet would now attempt to introduce among our fern names one that has never before been used in America, and one which is without question the worst selection that could possibly have been made. It is impossible in the light of all the evidence at hand to interpret this new departure in any other way than as a deliberate result of prejudice and an unwillingness to adopt a course of action simply because it accords with the principles of the Rochester system. Nothing short of this could explain the willingness to do a wrong thing, when the right one would have been not only the only correct course, but a perfectly natural course to pursue. To see that such is the case we have only to lay bare the facts underlying the history of the group.

The species of the present tribe Aspidieae so far as known to Linnaeus were included with his genus *Polypodium*. Ten years after the publication of *Species Plantarum*, Adanson published the

* Rhodora, 4: 7-13. Jan. 1902.

first genus in the present alliance calling special attention to the distinctive character of the superior indusium which was perhaps the most obvious mark that distinguished the European Aspidieae from *Polypodium*. Not only was this distinction clearly defined, but he mentions in addition the type of the genus and refers to illustrations that are absolutely unmistakable. He says:

“DRYOPTERIS: Paquets de fleurs ronds, disposés sur 2 rangs sous chaque division des feuilles. Enveloppe enparasol. Globules environnés d'un anneau élastique.”
Familles des Plantes, 2: 20. 1763.

And on page 551 (index) he adds:

“DRUOPTERIS Diosk. 20.
Filix mas *Fuchs*, *Tour.* t. 311, 312.
Fougere mâle Gall.”

thus citing not only the origin of the name dating back to Dioscorides, but also the name used by the old herbalists, the authentic figures of Tournefort,* and the name then current in France, which like our own familiar male-fern is the name which the plant has borne for the last three centuries or more in northern central Europe, where it is the commonest member of this genus either wild or in cultivation. I cannot conceive of a more complete, direct, and explicit establishment of a generic name than this, and yet Mr. Davenport's only comment on this bit of history is that “a genus so ill-defined, with its type standing for one thing and its description for another, has no just claim for consideration as against the more clearly defined *Nephrodium* which has been in use for nearly a century.” Surely we have here either an attempt to mislead those who do not have access to the original publications or a case of negligible ignorance of facts, either of which must stand in the same category of constructive error.

There being a definite genus established for our wood-ferns there is no necessity for another, but let us look a little farther into *Nephrodium* and discover if possible what this “more clearly defined” genus is. Richard, who edited Michaux's *Flora*, says:

“NEPHRODIUM. *Fructif.* Puncta in disco frondis sparsa seu seriata; primum obtecta membranula reniformi aut lunata, hinc (servato nexu laterali) dehiscente.”
Michaux, *Fl. Bor. Am.* 2: 266. 1803.

* To those who do not have access to Tournefort's classic *Institutiones* it may be said that t. 311 gives a clearly drawn figure of the upper third or so of a leaf of the male-fern showing the characteristic reniform indusia, and t. 312 gives various details including a segment greatly enlarged with the same characteristics in stronger relief.

So much for his description. Now what are the contents of this clearly defined genus with their modern equivalents, for it should always be borne in mind that a genus is a group of related species, not a definition or a description. We cite the species in the exact order of publication :

1. *N. acrostichoides* = *Polystichum acrostichoides*.
2. *N. thelypteroides* = ?
(= *Dryopteris Noveboracensis*, file D. C. Eaton).
3. *N. marginale* = *Dryopteris marginalis*.
4. *N. punctilobulum* = *Dennstaedtia punctilobula*.
5. *N. bulbiferum* = *Filix (Cystopteris) bulbifera*.
6. *N. filix-foemina* = *Asplenium filix-foemina*.
7. *N. asplenioides* = *Asplenium filix-foemina*.
8. *N. cristatum* = *Dryopteris cristata*.
9. *N. tenue* = *Filix (Cystopteris) fragilis*.
10. *N. rufidulum* = *Woodsia Ilvensis*.
11. *N. lanosum* = *Cheilanthes lanosa*.
12. *N. Dryopteris* = *Phegopteris Dryopteris*.

Surely this is a parody on "a more clearly defined" genus, judging from the *mélange* which Richard, its founder, placed in it, containing among its twelve species representatives of no less than eight well recognized genera, now distributed among four distinct tribes! No comment is necessary, and we could only wish for our friend that he were one tithe as anxious to establish a rational basis for nomenclature as he is to antagonize the "Rochester advocates" at whatever cost of consistency or good judgment.*

In connection with Mr. Davenport's statement that *Nephrodium* has been in use for nearly a century, we might say, lest his state-

* As a further illustration of misleading statements that occur in works supposed to carry the weight of authority, the following comment on *Nephrodium* is cited from John Smith (*History Filicum*, 206-207) : " This genus as originally characterized embraced species with both free and anastomosing veins, the technical character consisting in all having a reniform indusium. Schott restricted the genus to the species having anastomosing veins only." It is very probable that John Smith, like many another fern writer, never actually took the trouble to look inside Michaux's *Flora*, but assumed that because the great Hooker included both types in the genus that this was the condition in the original. Of the original twelve species described by Richard all are free-veined, and among the variety of indusia represented only two species have reniform ones and some have none at all !

ment should mislead the uninformed, that it has hitherto been used mainly at Kew, where their idea of its type (*Eunephrodium*) is entirely outside the range of even the diverse contents which its founder included in it; it has never been in use on the continent to include our north temperate wood-ferns and never at all in America since its foundation. *Dryopteris* was taken up by Schott and later by Asa Gray in the first edition of his *Manual*, and its use by Americans for the past decade has been practically unquestioned except by Mr. Davenport himself.

Another genus adopted by Mr. Davenport for our ferns is *Aspidium* of Swartz, which, by a sleight-of-hand performance unknown to any other advocate of the idea of a specific type for a genus, he lodges with *Aspidium trifoliatum* (*Polypodium trifoliatum* L.). Here again an insufficient examination of fern literature has placed him in a second error. We quote from a paper of Cavanilles published in 1799:

“TECTARIA: *Fructificacion* en puntos redondos, esparcidos, situados en la superficie posterior de la hoja. *Tegumento* umbilicado. *Abertura* casi circular. Exemplo de este genero: *Polypodium trifoliatum* de Linneo.” *Anales de Historia Natural*, * 1: 115. D. 1799.

It will thus be seen that the plant called *Aspidium trifoliatum* by Swartz is the monotype of *Tectaria*, which is a well-marked generic group as even Mr. Davenport is forced to admit. *Aspidium*, on the other hand, which he takes up for this species, was not proposed until 1801,† when Swartz described it as follows:

“ASPIDIUM. *Capsulae* in puncta subrotunda sparsa digestae, *Indusiis* umbilicatis l. dimidiatis tectae.” *Schrader's Journal für die Botanik*, 1800: 29. 1801.

Then follow some seventy or more species which Swartz combined in this genus and which are now variously distributed among several genera. The first six mentioned are:

1. *A. articulatum* = *Oleandra articulata*.
2. *A. pistillare* = *Oleandra neriiformis* Cav.
3. *A. trifoliatum* = *Tectaria trifoliata*.
4. *A. Lonchitis* = *Polystichum Lonchitis*.

* At the time of the publication of my “Genera of Ferns” I had not seen this rare series, of which a complete set containing a number of Cavanilles’ papers is now in the library of the New York Botanical Garden. The above is therefore the corrected date for *Tectaria* and *Oleandra* as published in my earlier paper.

† Mr. Davenport appears to be in doubt about this date, but had he examined the title page he would have found it perfectly clear.

5. *A. mucronatum* = *Polystichum mucronatum*.

6. *A. falcatum* = *Cyrtomium falcatum*.

On the application of the principle of regarding the first named species as the type of a genus, a principle which Mr. Davenport *professes* to accept, *Aspidium* becomes a straight synonym of *Oleandra*, which had been proposed by Cavanilles (*l. c.*) two years before, on the same page as *Tectaria* and immediately following it. On the unique application of a sliding scale in the matter of determining the type of a genus, which Mr. Davenport *actually does follow*, the name *Aspidium* would replace the later *Cyrtomium* proposed by Presl in 1836. But no one will be likely to consider seriously a system so illogical as his, and on any rational count *Aspidium* must pass into synonymy by the side of *Nephrodium*; we may consider ourselves fortunate to be able to dispense with two such unnatural groups of species as these were when first organized, and thus consign them to a merited oblivion.

The opening years of the fourth decade of the nineteenth century found us then with the following genera now forming a part of the Aspidieae properly established, each one traceable to a distinct and indisputable type :

DRYOPTERIS Adans. 1763.	POLYSTICHUM Roth, 1800 (?) *
MENISCIUM Schreber, 1791.	DIDYMOCHLAENA Desv. 1811.
TECTARIA Cav. 1799.	DIPTERIS Reinw. 1825.

It will be interesting to note the subsequent history of the group, since the extensive formation of fern genera has occurred since 1830.

In 1834 Schott † commenced a series of studies on genera, among which the following were considered :

ASPIDIUM, taken up for the species, *A. trifoliatum* Swz.

NEPHRODIUM, taken up for such species as *N. unitum*, *N. molle*, etc. This laid the foundation for the misconception of *Nephrodium* for species with connivent veins, and the application of the name to a group of species distinct from any originally in the genus.

* As already noted (Mem. Torrey Club, 6 : 262. 1899) there is still uncertainty of the date of publication of Roth's third volume. With a preface dated 14 Sept. 1798, and a title page dated 1800, we have some of his genera cited in papers published in 1799.

† Genera Filicum, 1834.

POLYSTICHUM Roth.

DRYOPTERIS Adans.

THELYPTERIS, adopted for *Aspidium Thelypteris* (L.) Swz. and its allies.

MENISCIUM Schreb.

Unfortunately Schott's studies were not systematized and were cut short by his death; several of the above genera even appear only in his "Observationes," a series of notes appended to his discussions and illustrations of genera.

It was Presl, however, who, in 1836,* commenced the process of generic expansion by founding a considerable number of new genera and adopting several older ones. His system was as follows.

ASPIDIACEAE

Nephrodia Presl

LASTREA Bory.†

OLEANDRA Cav.

NEPHROLEPIS Schott.

NEPHRODIUM Schott.

Aspidia Presl

POLYSTICHUM Schott.

PHANEROPHLEBIA Presl.

CYCLODIUM Presl.

CYRTOMIUM Presl.

SAGENIA Presl.

ASPIDIUM Schott.

DIDYMOCHLAENA Desv.

Presl cites Schott for several genera earlier named, thus recognizing the fact that he was using them in a sense different from that of their original authors.

Among his new genera was *Phanerophlebia* (p. 84) founded on *P. nobilis* (Schlecht.) to which must be joined *Amblia* (p. 184) which was founded on *A. juglandifolia* (H. & B.) on the misconceived notion that this species had no indusium.‡

Cyclodium (p. 85) was based on three species of the old world, of which *C. glandulosum* (Bl.) was first named, although *C. meniscioides* (Willd.) is perhaps better known. *Cyrtomium* (p. 85) was based on two old-world species, of which *C. falcatum* (L.) is not only the first named but is the long known plant common in

* Tentamen Pteridographiae. Prag, 1836.

† *Lastrea* contained three sections, the first of which was called *Dryopteris* but singularly did not contain the type species of Adanson's *Dryopteris* (*D. filix mas*) which instead was placed in *Thelypteris*.

‡ John Smith carelessly remarks (*Historia Filicum*, 204) "these two genera being evidently founded on specimens off which the indusium had fallen." This is true of *Amblia* but Presl (*l. c.*) says in establishing *Phanerophlebia*: "*Indusium orbiculare, pellatum.*" It is not always safe to trust the statements of the "authorities" and in taking up fern names it is often as essential to know fern literature accurately as it is to be familiar with growing ferns.

cultivation. *Sagenia* (p. 86) was founded on six species of which *S. lobata* (Rich.) is first named.

The non-indusiate species forming what has been known as *Phlegopteris* (in its later Mettenian sense) were left by Presl with *Polypodium* in a distinct tribe. The free-veined species he left under *Polypodium*, where they had been placed by Linnaeus, but in a distinct section which he named *Phlegopteris*. The old complex genus *Polypodium* was dismantled for the first time on the rational basis of venation, and among the aspidioid types, the genera *Goniopteris* and *Dictyopteris* were founded. *Goniopteris* (p. 181) was based on nine species, of which *G. incisa* (Swz.) was first named, and *Dictyopteris* (p. 194) was founded on four species, of which *D. attenuata* (R. Br.) was mentioned first; the last named genus is exclusively an old-world group, so need not be considered further here. *Pleocnemia* (p. 183), another old-world group, was also established, based on *P. Leuceana* (Gaud.) of the East Indies. *Meniscium* Schreb. was properly accepted, but appears under a third tribe (Grammitaceae) because of its elongate sori.

Link * was the next to divide the genera. His arrangement was as follows :

ASPIDIUM.	TECTARIA.
CYCLOSORUS.	BATHMIUM.
NEPHRODIUM.	DIDYMOCHLAENA.
POLYSTICHUM.	

Of these, *Aspidium* was taken up for the species with a reniform indusium and free veins (= *Dryopteris*). *Nephrodium* was taken up for what Schott had named *Nephrolepis*, thus shifting the name in still a new direction beyond the range of the eight genera *Nephrodium* originally contained ! *Tectaria* was adopted as a genus but was shifted to the group containing *Aspidium coriaceum* (Swz.), a species later included by Cavanilles in this genus; for *Tectaria trifoliata*, however, which was the sole type of its genus as founded, and its allies, Link proposed a new genus *Bathmium* (p. 114).† He also proposed *Cyclosorus* (p. 108) based on *C. gonglyodes*

* Filicum species in hort. reg. bot. Berol. cultae, 1841.

† This name was first proposed by Presl as a subgenus of *Aspidium* for the group containing *Aspidium Singaporanum* Wall. (= *Podopeltis* Fée). Link included also species of *Sagenia* Presl in *Bathmium*, making a new genus include an older one !

(Schk.) a fern from Guiana which Moore reduces to a synonym of *Nephrodium unitum*. *Cyclosorus* appears to be the first name definitely applied to a member of the group with connivent veins and cordato-reniform indusia (the § *Eunephrodium* of *Synopsis Filicum*).

Presl included the species of *Phegopteris* in *Polypodium*, but *Goniopteris* was kept distinct.

In 1841 John Smith* established the genus *Leptogramma*, based on seven species, of which *L. asplenoides* (Swz.) was first named. This genus, which has been placed by the Hookerian school in that monstrously incongruous group known as *Gymnogramme*, differs from *Phegopteris* solely in the possession of elongated sori and in any natural system must stand next to *Phegopteris* if not united with it.

In 1842 Hooker and Bauer established the genus *Fadyenia*† based on the single species known from Jamaica. In this work, *Genera Filicum*, the Preslian genera were largely taken up and this publication represents the most sane and sound pronouncement that ever emanated from Kew on the subject of the classification of ferns. More species of ferns by far have been described from Kew than from any other center of study in the world, but since the publication of *Genera Filicum* in 1842 their utterances on general fern classification have lapsed into a harmless *laissez faire* policy a half century behind the times, and a much greater amount behind their magnificent opportunities in herbarium and conservatory equipment and facilities.

In 1846 John Smith‡ further established the genus *Cyclopeltis*, based on a single West Indian species. His early views on genera quite closely coincided with those of Presl and his opinion of relationships merits particular attention since he knew growing ferns in cultivation probably better than any man who has ever lived. His later views on this group as expressed in *Historia Filicum* (1875) may be tabulated as follows (the exclusively old world genera in Roman type and those with American species in small capitals):

* Hook. Journ. Bot. 4: 51. 1841.

† Genera Filicum, pl. 53B. 1842.

‡ Bot. Magazine, 1846.

Phegopterideae.

{ Stegnogramme Blume (1828).	{ LASTREA Presl.
{ GONIOPTERIS Presl.	{ POLYSTICHUM Schott.
{ DRYOMENES Fée.*	{ Acrophorus Presl.
{ AMPHIHLESTRA Presl.†	{ ADENODERRIS J. Sm.¶
{ Dictyopteris Presl.	{ Arthropteris J. Sm.**
{ Dipteris Reinw. (1825).	{ Cyclopeltis J. Sm.
{ HYPODERRIS R. Br. (1830).	{ NEPHROLEPIS Schott.
{ Trichiocarpa J. Sm.	Isoloma J. Sm.††
{ PODOPELTIS Fée.‡	DIDYMOCHLAENA Desv.
{ ASPIDIUM (incl. <i>Sagenia</i>).	STRUTHIOPTERIS Willd.
{ CYCLODIUM Presl.	LEPTOGRAMMA J. Sm.
{ CYRTOMIUM Presl. (incl. <i>Phanero-</i>	{ PHEGOPTERIS Fée.
<i>phlebium</i>).	{ Hypolepis Bernh. (1806).
{ Pleocnemia Presl.	
{ NEPHRODIUM Schott.	
{ Mesochlaena R. Br.‡	
{ FADYENIA Hook.	

In 1850–1852 Fée published his *Genera Filicum* in which this tribe appears as follows:

Cyclodieae

{ POLYSTICHUM Roth.	OLEANDRA Cav.
{ PHANEROPHLEBIA Presl.	{ NEPHRODIUM Rich.
{ HEMICARDION Fée.	{ HAPLODICTYON Presl.
{ AMBLIA Presl.	{ ABACOPTERIS Fée. §§
{ CYCLODIUM Presl.	{ PLEOCNEMIA Presl.
{ CYRTOMIUM Presl.	{ SAGENIA Presl.
{ PODOPELTIS Fée.	{ PHLEBOGONIUM Fée.
{ BATHMIUM Link.	{ CARDIOCHLAENA Fée.
	{ FADYENIA Hook. & Bauer.
	Besides <i>Nephrolepis</i> and other genera
	now placed in Davalliace.

Aspidieae

{ ASPIDIUM Swz.
{ CYSTOPTERIS Bernh.
{ LEPIDONEVRON Fée.
{ DICHASIMUM A. Br.‡‡

* Founded on *Polypodium menisciocarpon* of Blume, but extended by Smith to include *P. plantagineum* L. They represent the non-indusiate type paralleling *Tectaria*.

† Based on *Pteris latifolia* H. & B.

‡ To the type named by Fée, Smith adds a second species, *P. sinuata*.

§ Horsefield, *Plantae Jav. rariores*, 1838; based on *Polypodium villosum*.

|| Based on *Aspidium nodosum* Blume of the old world.

¶ Based on *Aspidium glandulosum* Hook. & Grev. of the West Indies.

** Based on *Polypodium tenellum* Forst., of New Zealand.

†† Based on *Lindsaea lanuginosa* Wall.

‡‡ This was based on *Aspidium Donianum* Spreng. and was proposed by A. Braun (*Flora*, 24: 710. 1841) as a subgenus. Fée was, I think, the first to suggest generic rank for it (p. 302).

§§ Congr. Sci. de France 1: 178. 1843, based on *A. Philippinarum* Fée.

In the above arrangement Fée took several untenable positions and was perhaps inclined to increase genera unduly on which we would comment as follows :

1. *Phanerophlebia* and *Amblia* were both maintained following Presl's earlier misconception (*cf. supra*).

2. *Hemicardion* was substituted for *Cyclopeltis* J. Sm. and was based on the same monotype. This was not due to ignorance of the fact of an earlier genus, for he cites Smith's work ; it must be set down as a case of deliberate misappropriation of a genus, of which botanical literature is unfortunately too full of conspicuous examples.

3. In *Nephrodium*, as used by Fée, none of the original species were mentioned but it was confined to the species with connivent veins.

4. *Aspidium* was used for the free-veined species with cordato-reniform indusia (= *Dryopteris* Adans.), thus following Link.

5. *Bathmium* Link was taken up for *Tectaria trifoliata* and its allies.

6. Besides *Hemicardion* the following genera were established :

PODOPELTIS (p. 286) based on a single species, *P. Singaporiana* (Wall.). This has usually been united with *Tectaria*.

CARDIOCHLAENA (p. 314) based on several species of which *C. alata* from the Philippines is first named. This has usually been referred to *Sagenia*.

LEPIDONEVRON (p. 301) based on numerous species with the indusium adnate at the base and with pendulous leaves ; the first named species is *L. bidentatum* (Presl) ; the genus is usually referred to *Nephrolepis*, and hence belongs outside the tribe under consideration.

PHLEBIOGONIUM (p. 314) based on *P. impressum* (Griffith), an old-world species.

The non-indusiate series were still kept with the Polypodieae ; *Goniopteris* and *Dictyopteris* were retained, and *Phegopteris* of Presl was raised to generic rank (p. 242), *Polypodium Phegopteris* L. being properly named as the first and consequently type species.

In 1856 Mettenius* capped the climax of conservatism, and practically abandoned all structural characters except for sectional

* Filices hort. bot. Lipsiensis, 1856.

limitations combining all the genera of this series into *Aspidium* and *Phegopteris*, the former containing the indusiate and the latter the non-indusiate species regardless of vein characters or habit. Christ in 1897* followed his lead but included also *Fadyenia* Hook. & Bauer in the *mélange*.

During the next year Moore † published a synopsis of ferns which in general approximated those of Presl and Fée but differed in a number of features particularly in the inclusion of *Phegopteris* in *Polypodium*, a practice to which all Englishmen except John Smith seem to have been unfortunately addicted. Moore's arrangement is as follows :

Polypodiaceae.

POLYPODIUM (incl. <i>Phegopteris</i>).	POLYSTICHUM (incl. <i>Cyclopeltis</i>).
GONIOPTERIS.	FADYENIA.
DICTYOPTERIS.	SAGENIA.
DIPTERIS.	PLEOCNEMIA.

Aspidiæae.

ASPIDIUM (adopted for <i>Bathmium</i>	NEPHRODIUM (veins connivent).
Link <i>p. p.</i> , and <i>Podopeltis</i> Fée).	LASTREA (veins free).
CYRTOMIUM (incl. <i>Phanerophlebia</i>).	OLEANDRA.
CYCLODIUM.	NEPHROLEPIS.

The arrangement of Hooker ‡ is well known. *Polypodium* was retained in its Swartzian sense regardless of habit or venation and consequently contained such strange bedfellows as *Phegopteris*, *Goniopteris*, *Dictyopteris*, and *Dipteris* besides the whole array of erembryoid species; *Aspidium* was taken up for the centrally petate indusiate species of whatever type of venation and habit, and *Nephrodium* was similarly taken up for those species with a cordato-reniform indusium; in the last genus, § *Lastrea* contained the free-veined species, § *Eunephrodium*, the connivent-veined species, while the species with anastomosing veins were distributed among the sections *Sagenia* and *Pleocnemia*. *Didymochaena*, *Fadyenia*, and *Meniscium* were also maintained. As stated above, generic limitations at Kew have never represented natural genera, and yet having been popularized in such a general work as *Synopsis Filicum* they have had an influence probably wider than any other system

* Die Farnkräuter der Erde, 1897.

† Index Filicum, lxxxi-xc. Ap. 1857.

‡ Species Filicum, 4 : 5-150. 1862. Also Synopsis Filicum, 1874.

proposed, having been followed in the arrangement of herbaria and for tentative works by minor botanists the world over as a matter of convenience.

To give a telling example of the great range of nomenclatorial changes undergone by any particular species it is only necessary to follow the type of Adanson's genus *Dryopteris* through its various vicissitudes.

POLYPODIUM FILIX-MAS L., 1753, was placed in DRYOPTERIS by Adanson 1763, Schott 1834, Asa Gray, 1848, and Otto Kuntze, 1891; in ASPIDIUM by Swartz 1801 and 1806, Link 1841, Fée 1850-1852, Mettenius 1856, D. C. Eaton 1867, and Christ 1897; in LASTREA by Bory 1824, Presl 1836, Moore 1857, and John Smith 1875; and in NEPHRODIUM by Hooker 1862 and 1874.

Nephrodium as a genus has likewise had strange vicissitudes since its establishment for a grand *mélange* of American species in 1802. In 1834 Schott took it up for the connivently anastomosing veined species with cordato-reniform indusia in which he was followed by Presl 1836, Fée 1850-1852, Moore 1857, and John Smith 1875. Hooker 1862, also recognized this group as constituting the true *Nephrodium* type of his more comprehensive genus. In 1841 Link transferred the name to what Schott had called *Nephrolepis*. In 1852 Hooker gave the genus a wider significance so as to cover all species with cordato-reniform indusia.

In limiting *Nephrodium* to the free-veined species it will be seen that Mr. Davenport is following an entirely new lead and his statement that *Nephrodium* has been in use for nearly a century thus loses practically all of its force. In the sense in which he proposes it, it has never been used anywhere, and the attempt to bring it into use at this time is as reprehensible as it is uncalled for and irrational.

Aspidium as a genus has had a still more varied history. In 1834 Schott limited it to *Tectaria* and in this he was followed by Presl in 1836 and by Moore in 1857. John Smith in 1877 combined *Sagenia* with this giving the genus a wider range of characters. In 1841 Link limited the name to species with a cordate indusium and free veins thus making it synonymous with *Dryopteris*. In this he was followed by Fée in 1850-52. In 1862 Hooker took up the name for all forms with a peltate indusium irrespective of

the venation. In 1856 Mettenius went back to the Swartzian use of the genus including in it practically everything with a superior indusium; in this he was followed by D. C. Eaton in our own country, and by Dr. Christ of Basel.

After this *résumé* of migration and shifting of generic names and limits, if there be anyone who still supposes that the application of fern names in the past seventy years is a subject in which there has been any considerable degree of unanimity among the "authorities," or who still doubts the desirability and necessity of anchoring generic names to some fixed specific type in accordance with some rational principle, he is surely too blind to read history, or too slow to be worth waiting upon longer to make up his mind.

The ferns of our own country alone, or of the North Temperate zone even, do not form a sufficient series to enable one to judge clearly or logically in regard to true generic limitations. It is necessary to consider a wider range of species for this purpose. The following genera which are represented in America appear to us worthy of being retained; it will be seen that only three of these are represented in our Northern States. Certain extra-limital genera are also included to round up the system, and these representatives of the old-world flora are printed in italics, those of the American flora appearing in small capitals. Space forbids more than the briefest characterization here as follows:—

Veins normally free, simple, forked, or pinnately branched.

Indusium normally absent.

Sori more or less elongate.

LEPTOGRAMMA J. Sm.

Sori round, punctiform.

Margins of segments plane, herbaceous.

PHEGopteris Fée.

Margins of segments widely inflexed, membranous.

PLECOSORUS * Fée.

Indusium orbicular, centrally peltate.

Pinnae continuous with the rachis; texture firm, more or less coriaceous.

POLYSTICHUM Roth.

Pinnae articulated with the rachis, easily caducous; texture thin herbaceous.

CYCLOPELTIS J. Sm.

Indusium oval, attached by a central axis to a thickened linear receptacle.

DIDYMOCHLAENA Desv.

Indusium cordato-reniform, attached by the sinus.

* *Plecosorus* was established by Fée (Gen. Fil. 150. 1850-52) on *Cheilanthes speciosissimus* A. Br., which the Kew writers have retained in *Cheilanthes*.

Leaves simple, pedate; veins obscure.	CAMPTODIUM † Fée.
Leaves compound, pinnate; veins distinct.	DRYOPTERIS Adans.
Veins pinnate, usually uniting into simple areolae especially toward the outer margin, atypically free.	PHANEROPHLEBIA Presl.
Veins connivent, <i>i. e.</i> , the branches from contiguous pinnate groups uniting to form one or more arches.	
Indusium normally absent.	
Sori round, punctiform.	GONIOPTERIS Presl.
Sori elongate on the more or less parallel transverse arches.	
	MENISCIUM Schreb.
Indusium cordato-reniform, attached by the sinus.	CYCLOSORUS ‡ Link.
Indusium oblong, attached longitudinally by the center.	Mesochlaena R. Br.
Indusium orbicular, centrally peltate.	Cyc odium Presl.
Veins forming a single row of areolae next the midrib with free included veinlets; indusia elongate-cordate; leaves simple.	FADYENIA Hook. & Bauer.
Veins copiously anastomosing.	
Indusium normally absent.	
Leaves bipartite, the main veins dichotomous.	Dipteris Reinw.
Leaves pinnate.	Dictyopteris Presl.
Indusium orbicular, centrally peltate.	
Areolae regular, with the included veinlets straight and directed towards the margins of the segments.	Cyrtomium Presl.
Areolae irregular, fine, the included veinlets often branched and recurrent.	
	TECTARIA Cav.
Indusium cordato-reniform, attached by the sinus.	SAGENIA Presl.

In the above synopsis we have not included a series of extra-limital genera like *Luerssenia* Kuhn and *Cheiropteris* Christ of comparatively recent foundation, nor some of the older genera like *Pleocnemia* Presl, which are likewise extra-limital. The aspidioid generic groups which in *Synopsis Filicum* are wrongly bound up in the genus *Acrostichum* may form the subject of a later paper in the present series.

COLUMBIA UNIVERSITY, 24 February 1902.

† *Camptodium* was established by Fée (Gen. Filicum, 298. 1850-52) based on *Aspidium pedatum* Desv., an anomalous member of the group in habit and structure found in the West Indies.

‡ *Cyclosorus* Link, 1841, appears to be the first name correctly applied to a member of the group of species with connivent veins and cordato-reniform indusia. It represents the section *Eunephrodium* of *Synopsis Filicum* which followed the error started by Schott in 1834 in making *Nephrodium* stand for a group of species that its founder never included within its limits.